

Translation

PATENT COOPERATION TREATY



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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

510,599

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference BET03P0307	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FR2003/001091	International filing date (day/month/year) 07 avril 2003 (07.04.2003)	Priority date (day/month/year) 12 avril 2002 (12.04.2002)
International Patent Classification (IPC) or national classification and IPC G21D 5/08		
Applicant FRAMATOME ANP et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of <u>6</u> sheets, including this cover sheet.  <input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  These annexes consist of a total of <u>1</u> sheets.
3. This report contains indications relating to the following items:  I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application

Date of submission of the demand 05 novembre 2003 (05.11.2003)	Date of completion of this report 18 June 2004 (18.06.2004)
Name and mailing address of the IPEA/EP  Facsimile No.	Authorized officer  Telephone No.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FR2003/001091

## I. Basis of the report

1. This report has been drawn on the basis of (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

☒ the international application as originally filed.

☒ the description, pages 1-17, as originally filed,  
pages \_\_\_\_\_, filed with the demand,  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_,  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_.

☒ the claims, Nos. 2-14, as originally filed,  
Nos. \_\_\_\_\_, as amended under Article 19,  
Nos. \_\_\_\_\_, filed with the demand,  
Nos. 1, filed with the letter of 25 May 2004 (25.05.2004),  
Nos. \_\_\_\_\_, filed with the letter of \_\_\_\_\_.

☒ the drawings, sheets/fig 1/2-2/2, as originally filed,  
sheets/fig \_\_\_\_\_, filed with the demand,  
sheets/fig \_\_\_\_\_, filed with the letter of \_\_\_\_\_,  
sheets/fig \_\_\_\_\_, filed with the letter of \_\_\_\_\_.

2. The amendments have resulted in the cancellation of:

☐ the description, pages \_\_\_\_\_

☐ the claims, Nos. \_\_\_\_\_

☐ the drawings, sheets/fig \_\_\_\_\_

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FR 03/01091

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

## 1. Statement

Novelty (N)	Claims	1-14	YES
	Claims		NO
Inventive step (IS)	Claims	8-10, 14	YES
	Claims	1-7, 11-13	NO
Industrial applicability (IA)	Claims	1-14	YES
	Claims		NO

## 2. Citations and explanations

## 1. Reference is made to the following documents:

D1: GB 2 050 679

D2: US 3 218 802

D3: US 4 045 285

## 2. PCT Article 33

The present application fails to comply with the requirements of the PCT in so far as the subject matter of claims 1 to 7 and 11 to 13 does not involve an inventive step (PCT Article 33(3)).

The present application complies with the requirements of the PCT in so far as the subject matter of claims 8 to 10 and 14 is novel and involves an inventive step (PCT Article 33(2) and (3)).

Claims 1 and 5

D1 describes a method for generating electricity using the heat produced in the core of a high-temperature reactor (page 1, lines 3-9), comprising the following steps:

- circulating helium as the first heat exchange gas

(page 3, lines 27, 28) in a closed circuit through the reactor core (figure 1, reference sign 5),

- heating a second gas consisting of 50 % helium and 50 % nitrogen (page 3, lines 28-31) by means of a heat exchange with the first gas,
- using the second gas to drive a gas turbine (reference sign 8) coupled to an electricity generator (reference sign 9), and
- recovering part of the heat from the second gas by means of exchangers (reference signs 13, 15, 17) in order to cool the second gas.

Although it is not mentioned in D1, it is considered to be implicitly disclosed that water is used in the cooling loop since it is the usual heat transfer medium used in cooling towers (page 1, lines 42-45; page 3, lines 58-60).

The method of claim 1 differs from D1 in that the heat recovered from the second gas is used to heat and vaporise water and to drive a turbine coupled to the electricity generator.

As a means of enhancing the thermodynamic efficiency of a power plant, this measure is well known (see, e.g., D2, figures 1 and 2 and column 2, line 52 to column 3, line 5).

A person skilled in the art seeking at all times to improve the efficiency of the plant would thus use the arrangement of D2 and insert the turbine of D2 (figure 1, reference sign 16) into the cooling loop of D1 (figure 1, reference signs 13, 15, 17), and would consequently arrive at the subject matter of claims 1 and 5. It is entirely obvious that the turbine should be coupled to the electricity generator.

Dependent claims 2 to 9 and 11 to 13 do not appear to contain any features which, when combined with the features of any one of the claims to which they refer, might define subject matter that complies with the requirements of inventive step of the PCT, for the following reasons:

Claims 2, 11 and 12

The recovery of heat from the secondary fluid for use in an adjacent facility, e.g. an urban heating system, is already mentioned in D1 (page 1, lines 46-47) and D2 (column 3, lines 3-5). The circuit with the corresponding control valves does not constitute an inventive feature.

Claim 3

The production of hydrogen using a helium-cooled high-temperature nuclear reactor has already been suggested in D3.

Claims 4 and 13

Providing two simultaneously operating reactors doubles the power output and is a known measure in the field of energy production.

Claims 6 and 7

These claims suggest conventional measures that are known means of enhancing thermodynamic efficiency.

Claims 8 to 10 and 14

The features in claims 8 to 10 and 14 in combination with the claims on which they are dependent do not appear to be found in or obvious from the prior art.

Specifically, the use of a plate heat exchanger

(claim 8) leads to a good heat transfer coefficient but is vulnerable to all but the slightest pressure differentials. Measures are thus required to balance the primary and secondary pressures by providing a compressor to re-compress the secondary gas up to the primary gas pressure, as well as a balancing valve between the two circuits (claims 9, 10 and 14).

None of the documents cited in the international search report describes any such measures.

The type of exchanger is not specified in D1, nor is the pressure differential problem between the two circuits addressed therein.

The exchangers used in the device according to D2 are gas/liquid and liquid/liquid exchangers, meaning that they are not close to the subject matter claimed.

Similarly, D3 does not disclose details of the heat exchange devices, namely the steam generator (figure 2, reference sign 17), the cracking facility (reference sign 16) and the recovery exchanger (reference sign 19).

It follows that a person skilled in the art would not find any suggestions in D1, D2 or D3 of how to solve the problem of pressure differentials in two gas circuits.